Amendment to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Previously amended) An ion trap, comprising: a three-dimensional rotationally symmetric ring electrode and two cap electrodes with surfaces facing toward the inside of the ion trap, each said two cap electrodes being further composed of a first cone electrode and a second disk electrode; a first means for generating a time-varying, substantially quadrupole field, a second means for generating an independent dipole field; a third means for generating an independent, electrically variable DC higher multipole field.

2. (Cancelled)

3. (Previously presented) An ion trap, comprising: a three-dimensional rotationally symmetric ring electrode and two cap electrodes with surfaces facing toward the inside of the ion trap, each said two cap electrodes being further composed of a first cone electrode and a second disk electrode; a RF or periodic circuitry constructed and arranged for applying a RF or periodic voltage to said ring electrode to generate a main quadrupole field in said ion trap; an AC circuitry constructed and arranged for applying an AC voltage to said disk electrodes of said two cap electrodes to generate a dipole field in said ion trap; a DC circuitry constructed and arranged for applying an DC voltage to said cone electrodes of said two cap electrodes to generate an electrically variable electrostatic octopole field in said ion trap.

4. (Previously amended) An ion trap of claim 1, the cross-section of the surface of each one of the cap electrodes consists of a first portion of circle and a second portion of two straight lines jointed in orthogonal to the circle; the cross-sectional surface of the ring electrode consists of a portion of circle and two straight lines jointed in orthogonal to the circle; the surfaces of the two cap electrodes facing toward the inside of said ion trap.

5. (Original) The ion trap of claim 4 wherein said cap electrodes being further divided into a plurality of sets of component electrodes.

6. (Cancelled)

7. (Previously presented) The ion trap comprising: a three-dimensional rotationally symmetric ring electrode and two cap electrodes with surfaces facing toward the inside of

the ion trap, each said two cap electrodes being further composed of a first cone electrode and a second disk electrode; the surface of each one of the cap electrodes consists of first portion of spherical surface and a second portion of cone surface; the cross-sectional surface of the ring electrode consists of a portion of circle and two straight lines jointed in orthogonal to the circle; the surfaces of the two cap electrodes facing toward the inside of said ion trap, said cap electrodes being further divided into a plurality of sets of component electrodes, a RF or periodic circuitry constructed and arranged for applying a RF or periodic voltage to said ring electrode to generate a main quadrupole field in said ion trap; an AC circuitry constructed and arranged for applying an AC voltage to a first set of said plurality of sets of component electrodes to generate a main dipole field in said ion trap; a DC circuitry constructed and arranged for applying an DC voltage to a second set of said plurality of sets of component electrodes to generate an electrically variable electrostatic octopole field in said ion trap.

8. (Cancelled)

9. (Cancelled)

10. (Cancelled)

11. (Cancelled)

12. (Cancelled)

13. (Cancelled)

14. (Cancelled)

15. (Cancelled)

16. (Cancelled)

17. (Cancelled)

18. (Cancelled)

19. (Cancelled)

20. (Cancelled)

21. (Cancelled)

22. (Cancelled)

23. (Cancelled)

24. (Cancelled)

25. (Cancelled)

26. (Cancelled)

27. (Cancelled)

28. (Cancelled)

29. (Previously amended) The ion trap of claim 3, wherein the amplitude and frequency of the RF voltage or amplitude and period of the periodic voltage of the ion trap being kept at predetermined values; the amplitude of the DC voltage and the amplitude and frequency of the AC voltage vs. time of the ion trap being simultaneously swept or scanned to eject ion mass from the ion trap one after another.

30. (Previously amended) The ion trap of claim 7, wherein the amplitude and frequency of the RF voltage or amplitude and period of the periodic voltage of the ion trap being kept at predetermined values; the amplitude of the DC voltage and the amplitude and frequency of the AC voltage vs. time of the ion trap being simultaneously swept or scanned to eject ion mass from the ion trap one after another.

31. (Cancelled)

32. (Cancelled)

33. (Previously amended) The ion trap of claim 3, wherein the frequency of the RF voltage or the period of the periodic voltage and the frequency of the AC voltage of the ion trap being kept at predetermined values; the amplitudes of the RF voltage or the periodic voltage, the AC voltage and the DC voltage vs the time of the ion trap being simultaneously swept or scanned to eject ion mass from the trap one after another.

34. (Previously amended) The ion trap of claim 7, wherein the frequency of the RF voltage or the period of the periodic voltage and the frequency of the AC voltage of the ion trap being kept at predetermined values; the amplitudes of the RF voltage or the periodic voltage, the AC voltage and the DC voltage vs the time of the ion trap being simultaneously swept or scanned to eject ion mass from the trap one after another.

35. (Cancelled)

36. (Cancelled)

37. (Previously amended) The ion trap of claim 3, wherein the frequency of the AC voltage being set to zero; the amplitude of the AC voltage being set to be different from the amplitude of the DC voltage or zero; the frequency of the RF voltage or the period of

the periodic voltage of the ion trap being kept at predetermined value; the amplitudes of the RF voltage and DC voltage vs. time of the ion trap being simultaneously swept or scanned to eject ion mass from the trap one after another.

38. (Previously amended) The ion trap of claim 7, wherein the frequency of the AC voltage being set to zero; the amplitude of the AC voltage being set to be different from the amplitude of the DC voltage or zero; the frequency of the RF voltage or the period of the periodic voltage of the ion trap being kept at predetermined value; the amplitudes of the RF voltage and DC voltage vs. time of the ion trap being simultaneously swept or scanned to eject ion mass from the trap one after another.

39. (Cancelled)

40. (Cancelled)

41. (Previously amended) The ion trap of claim 3 wherein said DC circuitry adjusts said electrically variable electrostatic octopole field to compensate distortion of said quadrupole field.

42. (Previously amended) The ion trap of claim 29 wherein said ion trap is sealed in a vacuum chamber which is further pumped by a vacuum pump to provide a predetermined level of gas pressure in the trap, said ion trap adjusts the RF voltage, the DC voltage and the AC voltage along with the gas pressure in the trap to eject the ions of the ion trap with maximum or near optimal jumping distance to optimize the mass resolving power.

43. (Original) An ion trap system, comprising: an ion trap as in claim 3, sealed within a vacuum chamber being pumped by a vacuum pump to provide gas pressure in the ion trap.

44. (Original) An ion trap system, comprising: an ion trap as in claim 7, sealed within a vacuum chamber being pumped by a vacuum pump to provide gas pressure in the ion trap.

45. (Cancelled)

46. (Cancelled)

47. (Original) The ion trap system of claim 43 wherein said vacuum chamber having vacuum in the range between 10.sup.-2 to 10.sup.-1 mbar.

48. (Original) The ion trap system of claim 43 wherein said DC circuitry being constructed and arranged for applying an DC voltage to adjust the intensity of said electrically variable electrostatic octopole field in said ion trap to optimize the mass resolving power when said gas pressure is higher.

49. (Previously amended) An ion trap system of claim 43, wherein gas-phase

molecules being introduced through a membrane into an ionization area; said gas-phase molecules being ionized by a radioactive Ni beta source or multi-photon ionization of laser.

50. (Original) The ion trap system of claim 44 wherein said vacuum chamber having vacuum in the range between 10.sup.-2 to 10.sup.-1 mbar.

51. (Original) The ion trap system of claim 44 wherein said DC circuitry being constructed and arranged for applying an DC voltage to adjust the intensity of said electrically variable electrostatic octopole field in said ion trap to optimize the mass resolving power when said gas pressure is higher.

52. (Previously amended) An ion trap system of claim 44, wherein gas-phase molecules being introduced through a membrane into an ionization area; said gas-phase molecules being ionized by a radioactive Ni beta source or multi-photon ionization of laser.

53. (Cancelled)

54. (Cancelled)

55. (Cancelled)

56. (Cancelled)

57. (Cancelled)

58. (Cancelled)

59. (Cancelled)

60. (Cancelled)

61. (Original) A three-dimensional ion trap, comprising: A set of cap electrodes, each of said cap electrodes being further divided into a predetermined number of component electrodes having predetermined shape, a DC circuitry constructed and arranged for applying an DC voltage to a pair of said component electrodes of said cap electrodes to generate an independent electrically variable electrostatic octopole field in said ion trap.

62. (Cancelled)

63. (Cancelled)

64. (Previously amended) The ion trap of claim 1 wherein said ion trap analyzes ions mass by utilizing the independent, electrically variable DC higher multipole filed.

65. (Cancelled)

66. (Cancelled)

67. (Cancelled)

68. (Cancelled)